7. Methods may vary.

a) Since $5 \times 20 = 100$, multiply both the numerator and the denominator by 20.

$$\frac{6}{5} = \frac{6 \times 20}{5 \times 20}$$
$$= \frac{120}{100}$$
$$= 1.2$$

b)
$$-\frac{6}{5} = -\frac{6 \times 20}{5 \times 20}$$
$$= -\frac{120}{100}$$
$$= -1.2$$

c) Since $4 \times 25 = 100$, multiply both the numerator and the denominator by 25.

$$\frac{9}{4} = \frac{9 \times 25}{4 \times 25}$$
$$= \frac{225}{100}$$
$$= 2.25$$

d) In this case, use a calculator to divide 11 by 6.

$$-\frac{11}{6} = -1.8\overline{3}$$

8. **a)** The number line is labelled from –8 to –7. It is divided in tenths.
A is 9 tenths to the left of –7.
Write 9 tenths as a decimal:

$$\frac{9}{10} = 0.9$$

Then, A represents –7.9.

B is 2 tenths to the left of –7.
Write 2 tenths as a decimal:

$$\frac{2}{10} = 0.2$$

So, B represents –7.2.

b) The number line is labelled from –5 to –3. It is divided in fifths.
C is 2 fifths to the left of –4.
Write 2 fifths as a decimal:

$$\frac{2}{5} = \frac{4}{10}$$
$$= 0.4$$

So, C represents –4.4.

D is 1 fifth to the left of –3.
Write 1 fifth as a decimal:

$$\frac{1}{5} = \frac{2}{10}$$
$$= 0.2$$

D represents –3.2.

c) The number line is labelled from –1 to 0. It is divided in tenths.
J is 7 tenths to the left of 0. J represents –0.7.
K is 2 tenths to the left of 0. K represents –0.2.

d) The number line is labelled from –15.4 to –15.3.
Each tenth is divided in 10 equal parts, or hundredths.
G is 7 hundredths to the left of –15.3.
Write 7 hundredths as a decimal.

$$\frac{7}{100} = 0.07$$

G represents –15.37.
H is 2 hundredths to the left of –15.3.
Write 2 hundredths as a decimal.

$$\frac{2}{100} = 0.02$$

So, H represents –15.32.

9. The greater number is the number to the right on each number line.

a) –7.2; $-7.2 > -7.9$

b) –3.2; $-3.2 > -4.4$

c) –0.2; $-0.2 > -0.7$

d) –15.32; $-15.32 > -15.37$

10. a) The number line is labelled from –12 to –10. It is divided in fourths.
E is 1 fourth to the left of –11.
Then, E represents $-11\frac{1}{4}$, or $\frac{-45}{4}$.
F is 3 fourths to the left of –10.
Then, F represents $-10\frac{3}{4}$, or $\frac{-43}{4}$.

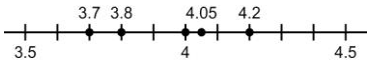
b) The number line is labelled from –6 to –5. It is divided in eighths.
L is 1 eighth to the left of –5.
Then, L represents $-5\frac{1}{8}$, or $\frac{-41}{8}$.
M is 6 eighths to the left of –5.
Then, M represents $-5\frac{6}{8} = -5\frac{3}{4}$, or $\frac{-23}{4}$.

c) The number line is labelled from –5 to –3. It is divided in sixths.
N is 1 sixth to the left of –4.
So, N represents $-4\frac{1}{6}$, or $\frac{-25}{6}$.
P is 4 sixths to the left of –3.
So, P represents $-3\frac{4}{6} = -3\frac{2}{3}$, or $\frac{-11}{3}$.

d) The number line is labelled in fourths from $-\frac{3}{4}$ to 0.
Each fourth is then divided in fourths, so the number line is divided in sixteenths.
Q is 9 sixteenths to the left of 0.
Then, Q represents $-\frac{9}{16}$.
R is 3 sixteenths to the left of 0.
Then, R represents $-\frac{3}{16}$.

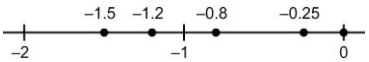
12. Answers will vary. For example: There are many rational numbers between each pair of numbers.

a) 3.7, 4.2
Sketch a number line divided in tenths and label it from 3.5 to 4.5.
Mark 3.7 and 4.2 on the number line.



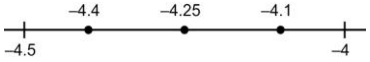
From the number line, 3 possible rational numbers are:
3.8, 4, and 4.05

b) –1.5, 0
Sketch a number line labelled from –2 to 0.
Mark –1.5 on the number line.



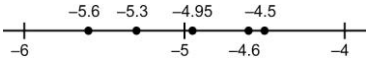
From the number line, 3 possible rational numbers are:
–1.2, –0.8, –0.25

c) –4.5, –4
Sketch a number line labelled from –4.5 to –4.



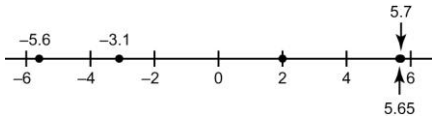
From the number line, 3 possible rational numbers are:
–4.4, –4.25, –4.1

d) –5.6, –4.5
Sketch a number line labelled from –6 to –4.
Mark –5.6 and –4.5 on the number line.



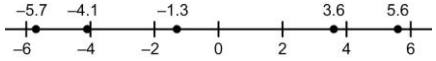
From the number line, 3 possible rational numbers are:
–5.3, –4.95, –4.6

e) –5.6, 5.7
Sketch a number line labelled from –6 to 6.
Mark –5.6 and 5.7 on the number line.



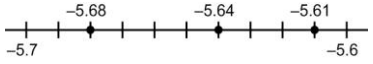
From the number line, 3 possible rational numbers are:
–3.1, 2, 5.65

f) 5.6, –5.7
Sketch a number line labelled from –6 to 6.
Mark –5.7 and 5.6 on the number line.



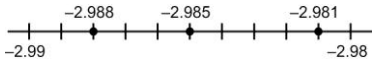
From the number line, 3 possible rational numbers are:
–4.1, –1.3, 3.6

g) –5.6, –5.7
Sketch a number line divided in ten equal parts, labelled from –5.7 to –5.6.



From the number line, 3 possible rational numbers are:
–5.68, –5.64, –5.61

h) –2.98, –2.99
Sketch a number line divided in ten equal parts, labelled from –2.99 to –2.98.

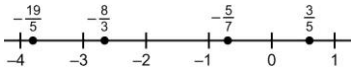


From the number line, 3 possible rational numbers are:
–2.988, –2.985, –2.981

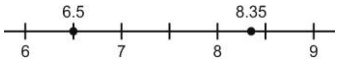
15. $\frac{3}{5}$ is close to 1 and $-\frac{19}{5}$ is close to –4.
Sketch a number line labelled from –4 to 1.
Write each fraction as a decimal before marking it on the number line. Use a calculator when necessary.

$\frac{3}{5} = \frac{6}{10} = 0.6$ $-\frac{5}{7} = 0.714\,285...$

$-\frac{8}{3} = -2.\overline{6}$ $-\frac{19}{5} = -3.8$

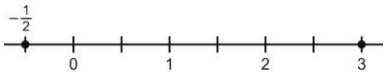


19. Explanations may vary. For example:
For positive numbers, the statement is always true.
The lesser number is closer to 0.
Example:
6.5 < 8.35; 6.5 is closer to 0 than 8.35 is.



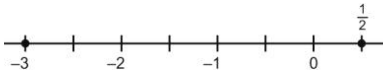
For negative numbers, the statement is never true.
The lesser number is farther from 0.
Example:
–3.4 < –1.5; –3.4 is farther from 0 than –1.5 is.

For numbers with opposite signs, the statement is sometimes true.
Example:
Consider 3 and $-\frac{1}{2}$.



The statement is true. $-\frac{1}{2} < 3$ and $-\frac{1}{2}$ is closer to 0 than 3 is.

Consider –3 and $\frac{1}{2}$.



The statement is false. $-3 < \frac{1}{2}$; however, $\frac{1}{2}$ is closer to zero than –3 is.

21. a) $-\frac{5}{7} \square -\frac{4}{7}$

To order fractions with the same denominators, compare the numerators.

$-5 < -4$

So, $-\frac{5}{7} < -\frac{4}{7}$

b) $-\frac{5}{6} \square -\frac{5}{7}$

Think: $\frac{1}{6}$ is greater than $\frac{1}{7}$.

So, $\frac{5}{6} > \frac{5}{7}$

And, $-\frac{5}{6} < -\frac{5}{7}$

c) $-2.2 \square -\frac{11}{5}$

Write $-\frac{11}{5}$ as a decimal.

$-\frac{11}{5} = -\frac{11 \times 2}{5 \times 2}$

So, $-2.2 = -\frac{11}{5}$

$= -\frac{22}{10}$

$= -2.2$

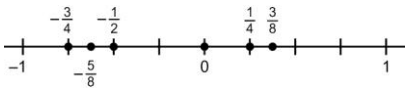
d) $-4.4\overline{6} \square -4.46$

$-4.4\overline{6} = -4.4666...$

So, $-4.4\overline{6} < -4.46$

24. a) $\frac{3}{8}, -\frac{3}{4}, -\frac{1}{2}, -\frac{5}{8}, \frac{1}{4}, 0$

Sketch a number line from –1 to 1, divided in fourths.



From greatest to least: $\frac{3}{8}, \frac{1}{4}, 0, -\frac{1}{2}, -\frac{5}{8}, -\frac{3}{4}$

b) $\frac{10}{9}, -\frac{5}{3}, \frac{7}{2}, -\frac{3}{2}, -\frac{7}{6}, \frac{17}{3}$

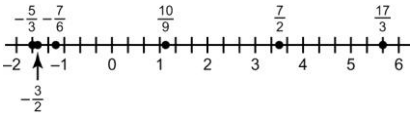
To help place each number on a number line, write each fraction as a decimal:

$\frac{10}{9} = 1.\overline{1}$ $-\frac{5}{3} = -1.\overline{6}$ $\frac{7}{2} = 3.5$

$-\frac{3}{2} = -1.5$ $-\frac{7}{6} = -1.1\overline{6}$

$\frac{17}{3} = 5.\overline{6}$

Sketch a number line labelled from –2 to 6.



From greatest to least: $\frac{17}{3}, \frac{7}{2}, \frac{10}{9}, -\frac{7}{6}, -\frac{3}{2}, -\frac{5}{3}$

c) $-\frac{9}{5}, -\frac{17}{10}, -1\frac{1}{2}, \frac{16}{4}, -\frac{11}{4}, \frac{21}{5}$

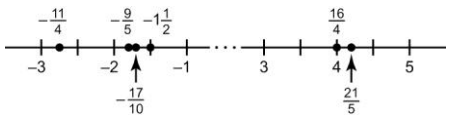
To help place each number on a number line, write each fraction as a decimal:

$-\frac{9}{5} = -1.8$ $-\frac{17}{10} = -1.7$ $-1\frac{1}{2} = -1.5$

$\frac{16}{4} = 4$ $-\frac{11}{4} = -2.75$

$\frac{21}{5} = 4.2$

Sketch a number line labelled from –3 to 5.



From greatest to least:

$\frac{21}{5}, \frac{16}{4}, -1\frac{1}{2}, -\frac{17}{10}, -\frac{9}{5}, -\frac{11}{4}$

d) $-\frac{11}{2}, \frac{10}{3}, 2\frac{1}{4}, -\frac{8}{6}, \frac{7}{12}, -\frac{6}{4}$

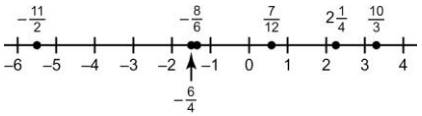
Write each fraction as a decimal.

$-\frac{11}{2} = -5.5$ $\frac{10}{3} = 3.\overline{3}$ $2\frac{1}{4} = 2.25$

$-\frac{8}{6} = -1.\overline{3}$ $\frac{7}{12} = 0.58\overline{3}$

$-\frac{6}{4} = -1.5$

Sketch a number labelled from –6 to 4.



From greatest to least: $\frac{10}{3}, 2\frac{1}{4}, \frac{7}{12}, -\frac{8}{6}, -\frac{6}{4}, -\frac{11}{2}$

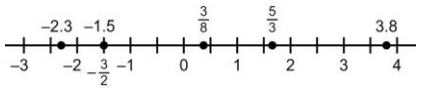
25. a) 3.8, $\frac{3}{8}$, –1.5, $\frac{5}{3}$, –2.3, $-\frac{3}{2}$

Write each fractions as a decimal.

$\frac{3}{8} = 0.375$ $\frac{5}{3} = 1.\overline{6}$

$-\frac{3}{2} = -1.5$

Sketch a number line labelled from –3 to 4.

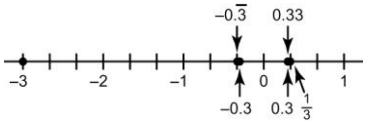


From least to greatest: –2.3, –1.5 ($-\frac{3}{2}$), $\frac{3}{8}, \frac{5}{3}$, 3.8

b) 0.3, $-0.\overline{3}$, $\frac{1}{3}$, –0.3, 0.33, –3

Write $\frac{1}{3}$ as a decimal: $\frac{1}{3} = 0.\overline{3}$

Sketch a number line labelled from –3 to 1.



From least to greatest:

$-3, -0.\overline{3}, -0.3, 0.3, 0.33, \frac{1}{3}$

26. A rational number is any number that can be written in the form $\frac{x}{y}$, where *x* and *y* are integers, $y \neq 0$.

Show that we can write each number in the form $\frac{x}{y}$.

a) $3 = \frac{3}{1}$

b) $-2 = \frac{-2}{1}$

c) $-0.5 = \frac{-1}{2}$

d) $-7.45 = -7\frac{45}{100}$

$= -\frac{745}{100}$

$= \frac{-745}{100}$

27. Any number that can be represented as a fraction is a rational number. Decimals that terminate or repeat can be expressed as fractions, so they are rational numbers.

a) $4.\overline{21}$ is a repeating decimal, so it is a rational number.

b) –3.121 121 112 111 12... does not appear to be a repeating decimal, so it is probably not a rational number.

c) 2.78 is a terminating decimal, so it is a rational number.

d) –2.122 222 22... appears to be a repeating decimal, so it is probably a rational number.